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DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

MISSOURI RIVER BASIN INVESTIGATIONS

LAND PLANNING AND CLASSIFICATION REPORT
as Relates to the Public Domain Lands
in the

LOWER PLATTE SUB-BASIN
(Platte River Basin)
NEBRASKA

Region III
Billings, Montana
March, 1948

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS - - - - - - - -	1
SUMMARY - - - - - - - -	2
INTRODUCTION:	
Location and Size - - - - - - - -	3
PURPOSE AND SCOPE - - - - - - - -	3
PHYSICAL FEATURES:	
Physiography - - - - - - - -	4
Drainage & Water Supply - - - - - - - -	5
Floods - - - - - - - -	7
Climate - - - - - - - -	7
Precipitation - - - - - - - -	8
Geology - - - - - - - -	11
Soils - - - - - - - -	11
Vegetation - - - - - - - -	13
ECONOMIC AND SOCIAL FACTORS:	
Cultural Development - - - - - - - -	14
Population - - - - - - - -	15
Land Classification - - - - - - - -	16
Agricultural Land - - - - - - - -	17
Recreation and Wildlife - - - - - - - -	20
Land Ownership - - - - - - - -	20
CLASSIFICATION OF PUBLIC DOMAIN - - - - - - - -	21
RECOMMENDATIONS - - - - - - - -	22

ILLUSTRATIONS:

Bibliography		25-26
Table 1	(Climatic Summary)	9
Table 1-A	(" ")	10
Table 2	(Crop Yields)	19
Plate I	(Crop Reporting Dists.)	17-A
Plate II	(Johnson Lake & Power Plant)	17-B
Plate III	(Dike near Omaha, Nebraska)	17-C
Map	(Lower Platte River Area)	27

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ACKNOWLEDGMENTS

Information for this report was gathered from many sources, including bulletins and other published material of the University of Nebraska, statistical data produced and distributed by the Bureau of Agricultural Economics, United States Department of Agriculture, the Weather Bureau, United States Department of Commerce, and Water Supply Papers of the Geological Survey, United States Department of the Interior, Reports of the Bureau of Reclamation, Department of the Interior, and the Division of Land Economics, Bureau of Agricultural Economics, were reviewed. Agricultural statistics published by the Nebraska Department of Agriculture and Inspection in Cooperation with the Division of Agricultural Statistics, United States Department of Agriculture, were used as reference material in the compilation of crop, livestock and income data. Public domain status information was furnished by the Division of Land Planning, Bureau of Land Management.

Interviews were had with representative county agents, farmers and ranchers in the area. Special mention is made of the assistance furnished by Dr. G. E. Condra, Dean of the Conservation and Survey Division, University of Nebraska and Dr. E. C. Reed, Assistant State Geologist, University of Nebraska, who made available the abundant reference material in their custody. Officials of the Soil Conservation Service, United States Department of Agriculture provided a land capability map which was very useful in connection with the examination of the public domain lands. Field work consisted of a detailed classification of public domain lands within the area, primarily to obtain an up-to-date inventory of the resources thereof, to determine their physical and economic relationship to the area as a whole, and to devise a feasible means of future management or disposal of such lands.

This work was conducted by John Q. Peterson, Range Examiner, who prepared and edited the report. Maps and charts which are a part of this report were prepared in the Missouri Basin Drafting Office, Bureau of Land Management under the supervision of Engineering Draftsman, Wm. C. Anderson. The study in all its aspects was under the supervision of Robert D. Nielson, Land Economist in Charge, Missouri Basin Investigations, Bureau of Land Management.

SUMMARY

The Lower Platte Sub-Basin covers a gross area of about 39,000 square miles. Most of this land is in private ownership. The relatively insignificant amount of public domain (18,525 acres) is scattered throughout the area in small isolated tracts. Some of these tracts are located along the main stem of the Missouri River and others are situated along certain of the tributary streams. Such tracts (totaling 1,222 acres) may be involved in the proposed irrigation and flood-control programs of the sub-basin and thus may be useful to the prosecution of these programs. Therefore, it is believed to be in the public interest to hold these tracts in status quo pending determination of their need for such public purposes. The remainder of the public domain in this area (totaling about 17,300 acres) likewise is in small isolated tracts scattered widely over the area. However, this latter acreage is so situated as to be of no influence or importance to future stream development programs. It contains no minerals or timber and can be used and managed effectively only in connection with adjacent lands. In effect the settlement, disposal and private acquisition of land in Nebraska through the years has created an enclave as to these remaining public domain lands.

Much of the area is well developed agriculturally, and a relatively small acreage is irrigated. Most of the sandhills section is restricted to grazing use where the production of cattle under a fenced pasture system has achieved a high degree of efficiency. Ground water for livestock use is plentiful and available at nominal cost almost anywhere in the sandhills region at reasonably shallow depths. The annual precipitation averages about 18 inches in the west and about 30 inches in the east. Three-fourths of this precipitation is received during the period April to September, inclusive. While the rainfall for the most part is normally adequate for the production of farm crops there are occasions when drought is widespread, in which case the crops suffer accordingly. Slightly less than one-half of the area is suitable for permanent cultivation while the remainder (approximately 12 million acres) is suitable for permanent vegetation. Corn is the principal crop and is fed mainly to livestock within the state. Wheat is the principal cash crop.

Floods and erosion are problems of increasing concern among the people as a whole regardless of whether they are engaged in agricultural pursuits. In the face of a highly efficient and generally prosperous agriculture, the population trend is downward. While few would contend that the area would attract great numbers of people on a strictly recreational plane, many believe that the economy and hence the population trends can be greatly improved through long-range flood control and irrigation development programs as contemplated in the area.

INTRODUCTION

Location and Size

The Lower Platte Project area, as shown on the accompanying map, spreads fan-like across the State of Nebraska from a point about 12 miles east of the Wyoming-Nebraska line, in Sioux County, to the Missouri River on the east. It includes that part of the Platte River drainage which enters the main stream below Kingsley Reservoir and that part of the South Platte drainage in Keith, Lincoln and Perkins Counties and involves, either in whole or in part, 62 of Nebraska's 93 counties. It includes part of the sandhill area of central Nebraska, a large part of which has no established surface runoff. Small ephemeral streams on the upland of this section are entirely dry except in periods after heavy rain but they quickly subside and the water spills into enclosed basins or small lakes where much of it is lost by evaporation and underground seepage, later emerging in the channels of such drainages as the Loup River system. With an east-west length of about 550 miles and an average width of 70 miles, this sub-basin embraces a total area of about 38,000 square miles, or slightly more than one-half of the State's total area.

As originally defined, the Lower Platte sub-basin area included the Blue River drainage in southeastern Nebraska and also certain minor drainages that enter the Missouri River below Plattsmouth. Since the Blue River drainage and also these minor drainages are outside the Platte River drainage system, and contain less than 10 acres of public domain, it is believed desirable to exclude them from this discussion. On the other hand this report does include the strip that borders the Missouri River between Plattsmouth and the mouth of Niobrara River although it too is outside the Platte River drainage. Despite the relatively minor importance of this latter area from the standpoint of irrigation, it does embrace a number of tracts of public domain which may have some degree of significance in relation to future navigation and flood control programs.

PURPOSE AND SCOPE

This report is based upon a field examination of the public domain lands and a research and analysis of physical, economic and related factors that pertain to the agricultural situation of the sub-basin as a whole. The public domain classification has as its purpose two primary objectives: 1) to obtain an inventory and appraisal of the resources thereof, and 2) to determine the importance and the influence which the public domain lands of the sub-basin now have or may have to the proposed conservation and development programs in the area as a whole.

A third aspect of the public domain classification is in reality a part of the first objective, namely, to secure information regarding said public domain lands sufficient to serve as a foundation for their proper disposition under applicable law.

With respect to the area as a whole, information was obtained by interview with local ranchers, farmers, county agents, teachers, research agencies and others engaged in the study and practice of agriculture in its many related fields. This was supplemented by a review of certain reports, maps and statistics relevant to the problem and by a reconnaissance survey of representative portions of the area.

PHYSICAL FEATURES

Physiography

The area belongs to the Great Plains province and is situated within the West North Central Geographic Division of the United States. Locally it consists of the loess hills near the Missouri River, the Nebraska plain, the sandhills section of north-central Nebraska and a segment of the high plains of Wyoming. Altitudes range from about 1000 feet at the mouth of the Platte River to 4200 feet or more in Sioux County. Much of the area presents a relatively level appearance but in many places it is quite hilly and well-drained. The relief in the so-called "hard" land areas has been produced by water action mainly. The relief in the sandy areas has been produced by wind over which a typical sandhill topography prevails. The sandhills cover nearly two-thirds of the Lower Platte drainage basin. Here the incoherent sand has been piled into irregularly distributed dunes and ridges from ten to more than a hundred feet high. Most of the dunes are covered with grass, are fairly stable, and have well-rounded tops. However, some disturbed areas locally known as "choppies" are much more angular. On such areas the grass cover has been destroyed and the sand has been whipped into sharp-topped hills and ridges, most of which are pitted by blow-outs, especially on their north and west sides.

A significant physiographic feature is the promiscuously scattered small inland lakes and enclosed basins which are characteristic of shallow water-table areas of the sandhills. These have an aggregate area of 151 square miles in ten of the "sandhill" counties. Such lakes are most numerous in Cherry, Garden and Grant Counties where 31, 43 and 18 square miles, respectively, of such lakes were reported in 1942.(12)

Drainage and Water Supply

The area is drained by the Platte River and numberous tributaries. The main Platte flows irregularly eastward through a broad flood plain below the confluence of North and South Platte Rivers near the town of North Platte. Principal streams entering the Platte (listed from west to east) are Wood River which enters the Platte near Grand Island, Loup River entering the main stream near Columbus, and Elkhorn River which joins the Platte about half-way between Fremont and Plattsmouth in Sarpy County. Each of these main tributaries is made up of smaller branches which collectively form a well-developed drainage system. All of the main tributaries have their sources within the sandhill section. The Loup River is perhaps unique among streams of the Missouri Basin in that its flow is remarkably constant and over much of its upper reaches, severe floods are unheard of. The Loup River is fed by many branches and by underground seepage. The sandhills have been likened to a huge sponge with tremendous absorptive capacity and a tendency to release surplus water with uncanny regularity. The principal branches of the Loup River system are: South Loup, with Mud Creek as its main tributary, Middle Loup, with Dismal River as its main tributary, and North Loup, with Calamus River, Cedar River and Beaver Creeks. Elkhorn River drains a sizeable portion of the sandhills section near O'Neill, and a considerable portion of northeast Nebraska through its North Branch and Logan Creek. Over much of the sandhills section surface drainage channels are not established. The outlets of most of their valleys and basins are obstructed by sand dunes, and the surplus surface moisture escapes mainly through the porous substratum. In some places, water accumulates in the lower-lying basins or parts thereof, creating patches of marshy land and shallow lakes. Ground water is abundant in the sandy soils and is found at relatively shallow depths. In the lower parts of the basin, however, where pumping is practiced, the ground water level is said to have receded considerably since 1931. Plum Creek in the south-central part of the sub-basin, Salt and Cottonwood Creeks in the southeastern part, are the only streams of consequence in the area which enter the Lower Platte from the south. The main Platte itself, and the northern tributaries, to some extent, form broad flood plains which overflow during periods of heavy rainfall. This is particularly so in the eastern and southern part of the sub-basin.

The area is highly developed agriculturally, the great bulk of cultivated land being situated in the eastern part. Substantially one-half of Nebraska's twenty million farmed acres are within this sub-basin. Irrigated areas are confined largely to the stream valleys of the main rivers. The area envelops more than one-half of the total sandhill region of the state where cattle raising on a fenced pasture

basis has reached a high degree of efficiency. The end product of agriculture in the sandhills is livestock, predominantly cattle. Only a comparatively small part of the arable land of the entire area is irrigated but the idea of irrigation as a form of crop insurance has gained much headway since the drought of the 1930's.

The Kingsley Dam, in about the center of Keith County, completed in recent years, was built primarily to store the flood and non-irrigation flow of the North Platte River.(1) The dam is about three miles long, back of which has been formed Lake McConoughy with a storage capacity of some 2,000,000 acre feet. This dam and reservoir are units of the central Nebraska Irrigation and Power Project which includes canals and laterals, power plants, distribution lines and the irrigation of considerable land in the Lower Platte valley between North Platte and Grand Island. About 25 miles east of Kingsley Dam is Sutherland Reservoir, fed from McConoughy Lake with storage sufficient to irrigate 100,000 acres as well as to furnish certain generating capacity for power plants near North Platte. Johnson Lake and Plum Creek Reservoir, near Lexington are examples of additional storage development along the Lower Platte. Near Columbus is the Loup River Public Power Project which diverts from the Loup River and returns water to the Platte below Columbus. This project has gained wide notice in the multiple purpose field of water conservation and use. The large power projects of the Lower Platte basin are tied together by high voltage transmission lines. The hook-up includes the Sutherland, Tri-County, Columbus and other projects and serves the rural electrification districts and also institutions and municipalities in a wide area.

According to Bureau of Reclamation estimates(2) this sub-basin has 435,000 acres under some irrigation and 1,300,000 acres of additional land which is suitable for irrigation.

The 1940 census reported the irrigation of 610,379 acres in the entire state. Most of this acreage is outside the Lower Platte basin above Kingsley Dam.

According to the United States Department of Agriculture(3) proposals for development in the state would increase the irrigated acreage of Nebraska by 1,482,300 acres, of which roughly 87 per cent would be new irrigated acreage and 92 per cent would be in the Lower Platte basin. Ground water development would account for about 290,000 acres. The amount of pump irrigation has increased quite rapidly during recent years. In 1944(4) there were more than 5,000 pump projects in the state, most of them operating from wells and irrigating an average of 50 to 60 acres each. Substantially all of the proposed irrigation development would be on private land.

According to the Department of Agriculture Report[3] only about 12 per cent of all the lands affected by this proposed development would become available for new farm settlement since the areas are already rather closely settled. In Nebraska as a whole, an estimated 177,640 acres of all land in proposed irrigation developments could be made available for 1,580 new farm opportunities. On the other hand, approximately 88 per cent of all proposed development will benefit existing farms.

FLOODS

Every large stream of the sub-basin has reached the flood stage in some part of its course. For complete flood control in the lower parts of the sub-basin it may be found feasible in connection with irrigation and power programs, to readjust the present land uses in certain of the valleys by placing farm homes on the terraces or valley sides and by using much of the floodable land for grazing, native hay production, wildlife habitat, forestation and some farming. Studies of flood frequency run-off and related features that contribute to floods are now being made by Federal and State agencies.

CLIMATE

The climate is characterized by a wide range in temperature and precipitation between winter and summer, but is well suited for producing feed and vegetable crops and for raising livestock. The eastern two-thirds of the area has a sub-humid precipitation (punctuated by occasional drought) and the western third is semi-arid where drought is more frequent. The bulk of the annual precipitation is received during the growing season. Frost free periods range from 122 to 164 days, giving the area ample growing season to produce the general farm crops for which the state ranks high among its neighbors. Winter and summer temperatures fluctuate between wide extremes, temperatures of -47 and 115 degrees, Fahrenheit, having been reported. Mean temperatures by seasons, over the area as a whole, are approximately as follows: spring, 46°F.; summer, 70°F.; fall, 50°F., and winter, 24°F. The respective average seasonal occurrence of precipitation is approximately as follows: spring, 30 per cent; summer, 40 per cent; fall, 20 per cent, and winter, 10 per cent. These averages, of course, are violated periodically by wide extremes both in seasonal and annual totals. About 77 per cent of the yearly precipitation is received during the period April to September, inclusive. For the area as a whole, snowfall accounts for less than 16 per cent of the annual precipitation. This percentage is greater in the west and smaller in the east. From about

October to April the prevailing wind is from the northwest and during the rest of the year it is from a southerly direction. Strong winds are common but tornado frequency is low. The total damage to crops from hail is considerably greater than that from tornadoes. In the more sparsely settled areas wind furnishes most of the power for pumping of stock water. Also many small appliances, such as radios, are operated from power harnessed from wind.

PRECIPITATION

The Nebraska section of the United States Weather Bureau operates 222 gauging stations in the state.[5] This agency in cooperation with the University of Nebraska and with State and Federal agencies, has issued many reports on rainfall and related climatic conditions covering many years. It has analyzed certain of the outstanding or extreme conditions which farmers, engineers, statisticians, planning groups, and in fact all interested people may use as guide material for their particular interests. According to these reports three severe dry periods have occurred in Nebraska since 1850. They are: 1846 to 1865[a], 1893 to 1895, and 1931 to 1940, inclusive. The latter two periods are described in the Weather Bureau records and are condensed in Nebraska Conservation Bulletin No. 25. The severe drought of 1893-95 was followed by a period of 34 years in which the departure from normal precipitation was not very marked except for the wet year 1915 when the precipitation was 35.57 inches over the state as a whole. During these years there were seven periods of 1 to 4 years each with precipitation below normal. There were 16 years with precipitation above normal and 19 below. The 10-year drought period 1931-40 produced the next driest single year of record - 1934, when the total rainfall was 14.44 inches, or 61 per cent of normal[6]. For convenience the state is divided into three climatic divisions, eastern, central, and western. An average low for all stations of the western division was attained in 1931 when this figure was 12.85 inches. An average high of 40.95 inches in 1915 was attained at the eastern division stations and these represent the extremes for the 48-year period 1896 to 1943, inclusive. Blair[5] points out that the average annual precipitation for the eastern third of the state is 27.69 inches; in the central third, 22.32 inches, and in the western third, 17.93 inches.

Long time averages of precipitation and related climatic data for ten representative stations in Nebraska are shown on Tables 1 and 1A.

(a) Based on historical data and early geologic reports made by White, Meek, Hayden and others, and on tree-ring studies made by the North Platte Agricultural Experiment Station.

TABLE 1

CLIMATIC SUMMARY
WEATHER BUREAU DATA(5)

REPRESENTATIVE STATIONS
LOWER PLATTE SUB-BASIN - NEBRASKA

		Temperature			Killing Frost-Average Dates			
Station	County	Length of Record (Yrs.)	Maximum °F.	Minimum °F.	Length of Record (Yrs.)	Last in Spring	First in Fall	Growing Season (Days)
Purdum	Blaine	36	112	-34	37	May 7	Sept. 30	146
Alliance	Box Butte	33	106	-40	32	May 12	Sept. 27	138
Ainsworth	Brown	30	112	-33	32	May 8	Oct. 4	149
Merriam	Cherry	22	112	-40	23	May 16	Sept. 23	130
Broken Bow	Custer	40	113	-42	40	May 8	Sept. 30	145
No. Platte	Lincoln	40	108	-35	40	Apr. 29	Oct. 6	160
Lincoln	Lancaster	40	115	-29	40	Apr. 18	Oct. 15	180
Newport	Rock	40	115	-36	40	May 7	Oct. 1	147
Bellevue	Sarpy	12	108	-31	16	Apr. 26	Oct. 13	170
Halsey	Thomas	34	109	-34	36	May 10	Sept. 30	143

CLIMATIC SUMMARY
WEATHER BUREAU DATA(5)

REPRESENTATIVE STATIONS
LOWER PLATTE SUB-BASIN - NEBRASKA

Station	County	Length of Rcd. (Yrs.)	Average Precipitation Jan. In.	Feb. In.	Mar. In.	Apr. In.	May In.	June In.	July In.	Aug. In.	Sept. In.	Oct. In.	Nov. In.	Dec. In.	Annual Inches
Purdum	Blaine	37	.59	.74	1.41	2.93	3.47	3.06	2.93	2.98	1.66	1.30	.66	.79	22.52
Alliance	Box Butte	37	.36	.52	.82	2.16	2.70	2.51	2.45	1.80	1.20	1.03	.46	.50	16.51
Ainsworth	Brown	39	.58	.81	1.37	2.32	3.77	3.40	2.84	2.89	2.01	1.40	.62	.85	22.86
Merriam	Cherry	25	.44	.41	.92	2.29	3.10	2.97	2.91	1.86	1.22	1.14	.69	.45	18.40
Broken Bow	Custer	40	.41	.61	.91	2.49	3.59	3.65	3.61	3.03	2.10	1.26	.73	.65	23.04
No. Platte	Lincoln	40	.32	.54	.86	2.08	2.88	2.94	2.61	2.32	1.53	1.06	.53	.53	18.20
Lincoln	Lancaster	40	.61	.93	1.20	2.24	3.56	4.01	3.62	3.70	3.42	1.86	1.37	.79	27.31
Newport	Rock	40	.54	.67	1.09	2.33	3.64	3.77	3.33	2.94	2.01	1.46	.60	.63	23.01
Bellevue	Sarpy	19	.83	1.10	1.37	2.21	4.56	4.58	3.75	3.38	3.71	2.12	1.37	1.04	30.02
Halsey	Thomas	36	.39	.51	.99	2.48	3.37	3.02	2.94	3.03	1.67	1.27	.54	.65	20.86

Geology

Nebraska is unique among Missouri Basin States in that its vast wealth of natural resources consists almost entirely of soil and water. There are no mining developments of any note. Not long ago, geologically speaking, two continental glaciers, coming from the northeast at different times, moved across what is now eastern Nebraska. Each of them changed the topography and influenced the climate and caused the deposition of alternating fine and coarse water-bearing formations. The first of these glaciers or ice invasions is known among geologists as the Nebraskan and the second as the Kansas. Some of the best agricultural soils were developed on the fine-textured glacial deposits. Widespread water-bearing formations filling the preglacial valleys and extending through the central, southern and eastern counties, were deposited by glacial outwash and from inwash from the west and northwest during glacial time. So, the initial setup in the origin of the most productive soils of Nebraska and the origin of extensive shallow water-bearing formations, was by continental glaciation.(4)

SOILS

Soils Surveys, a cooperative project of the Department of Agriculture and the University of Nebraska of many year's duration have been made and reports published covering most of the counties of the area. Certain of these surveys are completed only on a reconnaissance basis, namely for Cherry, Grant, Arthur, McPherson, Hooker, Thomas, Logan and Blaine Counties, and latest information indicates that reports on the same are lacking. Copies of published reports are for sale by the Superintendent of Documents.(7)

In terms of local vernacular the soils of the area are placed in two broad categories, hard lands and sand. The "hard" lands occupy mainly the level to gently rolling plain and prairie areas and the hilly sections in the eastern part of the State. In texture they range from fine, sandy loams to heavy loams and clay and in general they are the most fertile soils of the area. They include soils of the Holdrege, Dawes, Rosebud, Keith, Hall and other series which occupy smooth, rolling and hilly uplands. Generally these soils are light brown to dark brown in color, friable and productive and constitute the bulk of the crop lands in the sub-basin. They are readily erodable by both wind and water but fairly stable under commonly approved farm practices. These vary according to local situations from "no restrictions whatever" to "restricted use and intensive soil conserving practices".

Only a few of the sandy soils have attained normal development and maturity. With this group belong the vast areas of Dune sand and various sandy members of the Valentine, Anselmo, Bridgeport and Sarpy Series. Dune sand is the name applied to the vast area known as the Nebraska sandhills. It is by far the most extensive single type of soil in the area and occupies roughly 40 per cent of the area here under discussion. Dune sand consists of smooth, incoherent fine or medium sand which extends to great depths and often the top six feet or more has little change in texture. The surface four or five inches contains some organic matter but not enough to prevent drifting when the grass covering is removed. The material is retentive of moisture notwithstanding its loose consistency. Although it is quite uniform throughout the areas of its existence it varies within the several counties of its occurrence. For instance, in some places it has more silt, clay and organic matter than is typical, owing, perhaps, to the more favorable weathering conditions, coupled with more conservative use and better pasture management. However, over the sandhill area as a whole, it is subject to severe wind erosion when not protected by vegetation. While this soil type in its dune stage has a generally recognized value for grazing only, there are exceptions which produce variations in texture, structure and fertility. For example, the loamier areas in the swales and flats have a thicker grass covering than most of the slopes and hills and therefore a greater value for summer use as a rule. Also, many of the valleys between the dunes are close to the water table, produce a partial sod and are suitable for the production of native hay. In some localities they produce fair to good yields of corn and rye. Dune sand is extremely resistant to complete decomposition and over most of its area is so unstable that most of the organic material induced by decomposed vegetation is removed by wind when the vegetation is removed by the plow or by other influences.

This sandhill area represents a unique situation because natural conditions have virtually dictated a policy of conservative use which has resulted in range conservation and high production per unit of grazing area.(11) Early attempts at crop farming under the Kinkaid Act failed in this section. The settlers were for the most part unfamiliar with conditions and believed that the gently sloping and level lands could be plowed and farmed. With that viewpoint they went about the selection of their 640-acre homesteads by eliminating the most hilly lands in favor of the level so-called valley lands. This attempt to at first create a farming community out of the physically tillable lands resulted in abject failure for the most part and is responsible in most instances for the present situation of small isolated tracts of remaining public domain scattered over the area.

The bitter experience of failing crops and lost, windblown soil caused the survivors or their successors to consolidate their holdings into larger units, discontinue cropping practices, and fence their lands. Thus,

a large and successful cattle industry developed in this area based upon the use of most of the land for pasture and hay meadows. A small part, probably less than one per cent is now used for crops.

Many of those who withstood the transition from a farming venture to a predominantly grazing practice point out that it was many years before they knew how to get the most out of this vast grassed empire. This knowledge came with the introduction of cottonseed cake and similar protein concentrates, during the drought of the 1930's, and has resulted in better weights, larger calf crops and intelligent systems of pasture rotation. Significant in this connection is the fact that the vigor and density of certain coarse grasses are yielding to more desirable species and the range itself is said to be steadily improving with use. Also, it has been discovered during the past 15 years that the hilly areas when supplemented with concentrates are in many cases the safest and therefore most desirable areas for winter use.

Vegetation

The succession of native vegetation in this basin adheres generally to a pattern conforming to a wide range of conditions for plant growth. As one travels from the sandhill lakes to the hardland area, many stages in natural succession are observed. Two primary reasons for this variation are the difference in height of water table and the difference in soil texture. In the low meadows of the sandhills for example, the water table is near the surface and as one ascends the dunes the texture of the soil becomes coarser, vegetation densities decrease, and the situation is one of increasing importance to the conservation of moisture.

Because of the high absorptive capacity of the sandy soil, this part of the sub-basin area supports a more luxuriant type of vegetation than would be expected on the heavier soils of the midwest region. The sandhill grassland was classified by Weaver and Clements[a] as tall-grass prairie, a post-climax of the true prairie association. In a broad sense the flora of the sandhills is strikingly uniform.[8]

In the sandy soils, blue stem, hairy grama, needle grass, june grass, sand dropseed, panic grass, reedgrass and blue grama are most common. In the prairie region (eastern part) the native grasses are of the tall grass-sod forming type, chiefly big bluestem and little bluestem, with grama grass and numerous mid grass species.

Native tree growth consisting mainly of willow, ash, elm, box-elder and cottonwood occurs along the major streams. This fills certain

(a) Plant Ecology (2nd Edition) 1938 - McGraw-Hill Book Company.

local needs for posts, fuel and shelter. Shelter-belt plantings, many of which have taken place during the past ten years, consist mainly of Russian olive, boxelder, elm, cedar and pine. These plantings have not been uniformly successful but sufficiently so to become a factor in the control of soil movement while at the same time serving as wind-breaks and for shade. As a result many ranchers have initiated plantings, some of which have attained success. The nursery within the Nebraska National Forest, in Thomas and Blaine Counties has become a reliable source of nursery stock of species adapted to the sandhills region.

Pasture studies in 1940 (8) indicated that grasses in the sandhills contribute 80.5 per cent to the vegetative density of the area and 94.5 per cent of the total forage production of grazing lands in that section. Among the principal contributors to said forage production are:

Common Name	Latin Name
Sand reedgrass	Calamovilfa longifolia
Sand dropseed	Sporobolus cryptandrus
Hairy grama	Bouteloua hirsuta
Panic grass	Panicum virgatum
Big bluestem	Andropogon furcatus
Sloughgrass	Spartina pectinata
Little bluestem	Andropogon scoparius
Dune sedge	Carex spp.
Bluegrass	Poa spp.
Sandhill bluestem	Andropogon hallii

The above ten species represent less than 10 per cent of the number of plant species growing native in the area but contribute 78 per cent of the total native forage production on the public domain lands of the area. Inferior or noxious plants, mainly weeds, include pigweed, sunflower, Russian thistle, sandburr and soapweed.

ECONOMIC AND SOCIAL FACTORS

Cultural Development

For the most part, the activities of trade and industry in Nebraska flourish when farming and stock-raising flourish. Aside from soil and water and certain fish and wildlife there are no other natural resources of outstanding economic importance in the area. Railroads, highways, airways, and telephone communications funnel through the principal centers of population. The total population is predominately rural. The area is served by three trans-continental railroads, namely, the Union Pacific, the Chicago, Burlington and Quincy, and the Chicago & Northwestern

Branch lines of the Chicago Burlington and Quincy extend into certain interior areas. Principal east-west highways are U.S. No. 30, 2, and 30. North-south highways and secondary roads are numerous. In the eastern part of the area they follow section lines mainly except where the contour rules differently. All roads in the heart of the sandhills, except certain principal highways, are crude and frequently impassable. Development of hydro-electric power and growth of rural electrification have advanced rapidly in recent years and many farms and ranches have taken advantage of these facilities.

Wheat is the leading cash crop and corn which is fed to livestock within the state mainly is the leader in dollar value. Significant features of crop values and production are discussed elsewhere in this report. Values of livestock on farms in the state in 1910, 1920, 1930, and 1940 were $211,562,514; $326,014,912; $263,782,480, and $155,576,877, respectively. (Note the drop in 1940 which was the end of a ten-year drought). By 1945 this figure had increased to [illegible] $443,000,000.(9) According to the State Department of Agriculture(9) livestock and livestock products account for about three-fourths of the farm income of the state. Cash farm income, exclusive of government payments, as reported by the Bureau of Agricultural Economics totaled $166,604,000 in 1932, $468,861,000 in 1942, $653,607,000 in 1943, and roughly 70 per cent of total cash farm income. Feed and food processing plants, such as alfalfa mills, flour and feed mills, slaughtering plants and stockyards are important segments of the agricultural industry of the area. Omaha is one of the leading livestock markets of the United States.

Population

The population of Nebraska which began to decrease in the 1920's showed a definite downward trend during the period 1930 to 1940. At the same time there was a shift of the population within the state from rural to urban. This trend is believed to be continuing.

According to the 16th U.S. Census of 1940, there was a decrease in total population in the State of 61,129, or 4.5 per cent, from that of the previous decade. The rural population decreased 10.0 per cent but the urban population increased 5.8 per cent. The 1940 population was 39.1 per cent urban and 60.9 per cent rural. Population in 1930 was 1,377,963, and in 1940, 1,315,834.

The average size of farms and ranches has increased over the past two decades. Partly, this is due to the advances made in power machinery and equipment which afforded greater crop and livestock production per unit of man power. Another reason may be attributed to soil

losses which cause reduced production and employment and therefore result in decreased opportunities for permanent small business in the rural areas. Soil survey reports of the area almost invariably speak of the intricate pattern of relief caused by erosion of the Nebraska plain; of the "head cutting" of minor streams, causing necessary adjustments in farm practices. These influences no doubt bear directly on recent population trends. The proposed program for irrigation and flood control in the area should become a dominant influence in reversing this population trend.

Presumably a similar pattern of shifts and decreases in population prevailed within the Lower Platte sub-basin as occurred in the State. Within its boundaries are Omaha and Lincoln, with 1940 populations of 223,844 and 81,984, respectively. Grand Island, Columbus, Fremont, Kearney and North Platte are other important shipping and trade centers within the basin. Many of the State's institutions of higher education, including the University of Nebraska at Lincoln, are located in cities within the sub-basin.

Land Classification

A cooperative project by the Soil Conservation Service and the University of Nebraska resulted, among other things, in the production of a map in color which shows eight broad soil groups and 59 land types in the State. A land type area according to this study is an area in which the physical land conditions are similar. They are described in general terms that apply to the soils, slope and erosion, for example: "Deep medium textured soils on nearly level to gently rolling slopes with slight erosion."

This study prescribes also eight land use capability classes based primarily on the intensity or complexity of conservation treatment required to protect the land from erosion losses and obtain maximum conservation of moisture. The eight classes of land, the types of land-use practices recommended, and the respective acreages of each class in the State as a whole are reported to be as follows:

Land Suitable for Cultivation

Class I	Requires no special conservation practices	- 5,222,658 Acres
Class II	Requires simple conservation practices	- 7,605,071 "
Class III	Requires intensive conservation practices	- 8,521,547 "
Class IV	Requires limited use and intensive conservation practices	- 2,625,783 "

(Cont'd.)

Land Suitable for Permanent Vegetation

Class V	Requires no restrictions	- 2,389,261 Acres
Class VI	Requires moderate restrictions in use	- 7,928,056 "
Class VII	Requires severe restrictions in use	- 14,358,482 "
Class VIII	Wild Life areas only	- 138,125 "
ALL CLASSES - TOTAL		- 48,788,983 Acres.

The public domain falls mainly within Classes VI and VII.

According to latest information, all except seven of the 93 counties of Nebraska were in organized soil conservation districts during 1947, involving a total area of 38,864,066 acres. With its headquarters at Lincoln, the Great Plains region of the Soil Conservation Service operates within substantially the same territory as Region III of the Bureau of Land Management.

The organization and general direction of the soil conservation district program under the Nebraska State Soil-Water Conservation Committee(4) is composed of the Dean of the College of Agriculture, Director of the Agricultural Extension Service, a member of the United States Soil Conservation Service, and the Dean of the Conservation and Survey Division of the University of Nebraska. The districts are managed by local supervisors and the conservation practices are then recommended by conservation survey and approved by the district supervisors and land owners. The Soil Conservation Service furnishes technicians to assist the supervisors and farmers in the determination of what control measures are needed. They do not regiment the farmers and land operators, but many devices, such as payments and publicity are used to implement and advance the program.

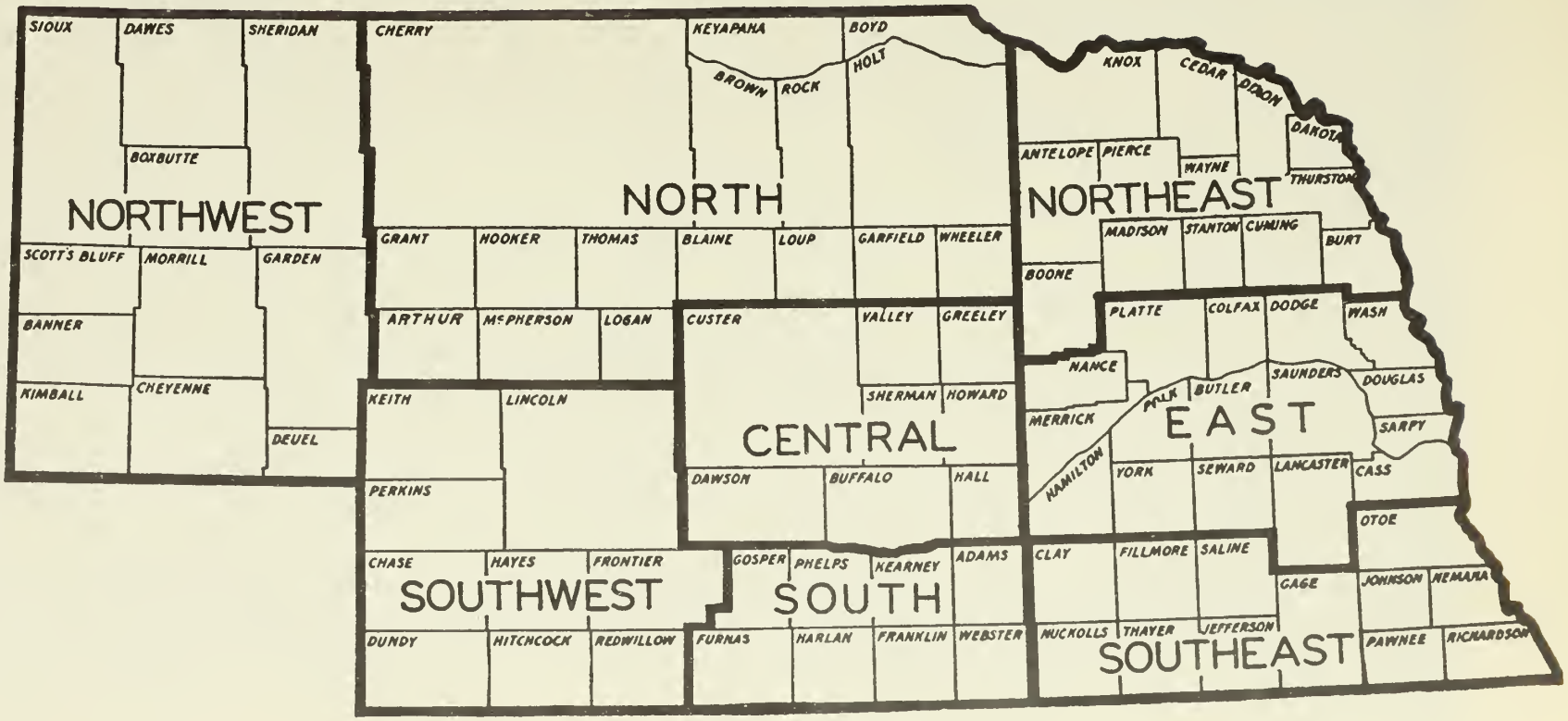
Agricultural Land

Plate I shows the various districts into which the State is subdivided for the purpose of reporting crop and livestock statistics.

In 1943, Nebraska ranked fourth among the states in total harvested acreage of principal crops, and tenth in total cash farm income.(9) Corn production during that year in the State was nearly double the 10-year (1933-42) average, wheat the second largest crop since 1930, oats the largest since 1932, barley the third largest on record, rye and potatoes the second largest on record, while the alfalfa seed, soybean and dry bean crops were the largest on record. Cattle and hog numbers

PLATE I

NEBRASKA CROP REPORTING DISTRICTS



FROM ANNUAL REPORT, 1943, NEBRASKA DEPARTMENT OF AGRICULTURE AND INSPECTION.

PLATE II

JOHNSON LAKE AND POWER PLANT NEAR LEXINGTON NEBRASKA TYPIFIES RECLAMATION FOR INCREASING PRODUCTION.

PHOTO BY SAVAGE

PLATE III

DIKE NEAR OMAHA NEBRASKA TYPIFIES PROTECTION OF CROPS AND CROP LANDS ALREADY DEVELOPED.

PHOTO BY SAVAGE

were at the highest level since pre-drought years. Corn, wheat, oats and wild hay accounted for 80 per cent of the harvested acreage of all crops while cattle, hogs, corn, wheat and dairy products were responsible for 76 per cent of the source of cash farm income in 1943.(13)

In the sandhills actual farm crop production is limited substantially to corn and rye. Average yields are low in comparison to the stabilized farming section, being less than 12 and 10 bushels per acre, respectively; whereas, for the state as a whole the average yields per acre of corn and rye are about 23 and 12 bushels, respectively.

The north district of the State (Plate I) which includes the bulk of sandhills counties produces about 1.3 million tons of wild hay from an average of about 1.8 million acres. This is significant because of its importance as a producer of feeder cattle. This section annually produces, or at least supports, from .8 million to one million cattle a year or about one-fourth of the total cattle produced in the State. These facts emphasize the importance of the sandhill vegetation to the economy of the region itself as well as to that of the State as a whole.

Table 2 shows average acre yields of selected farm crops by districts in Nebraska for the crop years 1943 and 1946.(10) Unit values of all products had increased materially in 1946 over 1943. Still further increases in unit values, including both crops and livestock, were apparent in 1947. This, of course, is reflected in higher land prices and accounts for the fact that people are willing to pay five dollars or more per acre for the public domain lands at this time, whereas in the 1930's similar lands sold for much less. Figures for 1947 are not as yet available. Of interest are figures showing gross cash receipts by Nebraska farmers for crops and livestock in 1927 and 1946. (A 20-year interval) These amounts are exclusive of government payments. No such payments were made in 1927.(10)

Cash Income from Farm Marketings

Year	Crops	Livestock and Livestock Products	Crops and Livestock Total[a]
1927	$126,249,000	$292,115,000	$418,384,000
1946	$318,846,000	$580,864,000	$899,710,000

(a) This is gross receipts. Net receipts are usually one-half of gross receipts.

TABLE 2

AVERAGE ACRE YIELDS OF SELECTED CROPS BY DISTRICTS
NEBRASKA (10)

(See Plate I)	Corn Acre Yield Bu. 1943	Corn Acre Yield Bu. 1946	Winter Wheat Acre Yield Bu. 1943	Winter Wheat Acre Yield Bu. 1946	Oats Acre Yield Bu. 1943	Oats Acre Yield Bu. 1946	Wild Hay Acre Yield Bu. 1943	Wild Hay Acre Yield Bu. 1946
Northwest	15.7	16.0	25.0	29.7	26.5	34.3	.69	.64
North	12.1	18.3	14.7	17.2	23.9	25.8	.61	.59
Northeast	25.8	32.1	17.4	21.2	31.8	30.8	.87	.81
Central	21.5	18.4	19.0	17.9	23.8	20.4	.75	.60
Eastern	36.7	39.1	19.3	23.7	38.5	28.3	1.12	1.19
Southwest	14.7	19.4	21.2	25.9	24.2	26.8	.84	.70
South	20.8	18.0	20.5	15.2	27.7	20.5	.92	.68
Southeast	31.8	32.0	19.7	19.3	36.1	25.8	1.25	.88
STATE	26.0	29.0	21.0	23.0	33.0	28.0	.70	.65

Recreation and Wildlife

Few if any of the public domain tracts are suitable by themselves for recreational purposes or for wildlife habitat. The lakes and streams of Nebraska furnish excellent habitat for migratory waterfowl. Many of the lakes in the sandhill region are at the ground water level, fluctuating in depth with the dry and wet periods of the year. Others are more permanent and have importance, not only in the matter of waterfowl but also for other wildlife development. The borders of most of them are marshy, making good habitat for Muskrat and several kinds of water fowl and upland game birds.

The Valentine migratory waterfowl refuge in Cherry County and the Cresent Lake Bird Refuge in Garden County receive the expert attention of the Nebraska Game, Forestation and Parks Commission in cooperation with the Fish and Wildlife Service. These agencies also encourage public use of numerous recreational grounds throughout the State.

Upland game birds include pheasant and quail. Streams and lakes are reported to contain a number of species of game fish.

Land Ownership[a]

The 39,000 square mile area under discussion (roughly 24,960,000 acres) is broken down into ownership categories approximately as follows:

Private	- - -	23,500,000 Acres
State and County	- - -	1,326,275 "
Federal:		
National Forest	- - -	115,200 "
Public Domain	- - -	18,525 "

Under State law the state owned lands (originally Sections 16 and 36) can not be sold. This land is leased mainly for grazing and farming and is a source of considerable state revenue. State land leases are made on a long-term basis at fees commensurate with grazing and farming capacities of the respective tracts. Thus, in a given locality the income from different sections of state land varies widely. Grazing fees in Nebraska National Forest amount to about forty cents per animal unit month. Privately owned grazing lands are leased on both per acre and per head per season bases. Depending on local situations, the lease price for such lands may vary from thirty-five cents to more than one dollar per acre per year. Public domain lands leased under Section 15 of the Taylor Act bring about six cents per acre per year on the average.

(a) All acreages except public domain are estimates. Public domain from status records of Region 3, Bur. of Land Mgt., Billings, Montana.

The public domain lands are a minor part of the entire land setup. Generally speaking, they can serve no useful purpose in any future public program in the area. Possible exceptions are tracts of public domain riparian to the Loup, Platte and Missouri Rivers. (Described under "Recommendations").

CLASSIFICATION OF PUBLIC DOMAIN

The public domain is composed of scattered remnants, the "left-overs" of an era of land settlement which had its first great impetus following the passage of the Homestead Act of 1862. Next large areas passed into private hands by way of grants to railroads. The third surge of land settlement was under the Kincaid Act of 1904 which allowed 640 acres of sandhills land to each homesteader.

Totaling 18,525 acres the remaining public domain is in small isolated tracts, mainly 40's and 80's. The smallest is less than one acre and the largest is 568.60 acres. This latter tract is located on the Missouri River flood plain in Knox County. Specifically the public domain consists of 293 parcels scattered in 148 townships within 24 of the 62 counties. (See map). The bulk of it is in the sandhills, mainly within Grant, Hooker, Cherry, Thomas, Blaine, McPherson, Logan, Brown, Rock, Loup, Holt and Garfield Counties.

These lands are used for grazing in connection with adjacent non-public domain lands. This is the principal, and in most cases, the only use to which they can be put. For the most part the public domain lands are in good condition, although if the grass cover is disturbed by plowing or over-grazing they are subject to wind or water erosion. The sandhill lands have a normal covering of native grass with an average density of about five-tenths. Generally speaking, these tracts are situated within boundary fences of large ranches. In such cases the competition for use of same is more or less limited. Other tracts are adjacent to private or state lands owned or controlled by two or more individuals. In such cases the use has been determined by local agreement. This pertains to unleased public domain lands. Leases, of course, are respected, and leased lands are usually fenced in with the property of the lessee. As of July, 1947, according to records of the Division of Adjudication, 6,017.39 acres of the 18,525.70 acres of public domain in the basin were under grazing lease. The remaining 12,508.31 acres, either are idle or are used by some one without charge or authority. This would seem to indicate the need for an aggressive program on the part of the Bureau of Land Management in this area looking to the proper disposition of the public domain lands.

Essential detail pertaining to the classification of individual tracts of public domain is on file in the Regional Office, Bureau of Land Management, Billings, Montana.

RECOMMENDATIONS

There is no District Land office in the area and many of the local people are either ignorant of or indifferent to the opportunities provided by the Taylor Grazing Act. Indications are that many, perhaps the majority of property owners who are eligible to lease or purchase public domain tracts in this area would perfer to buy the land under provisions of Section 14 of the Taylor Act. To accomplish this with the least expense to all concerned two things are suggested:

1. That the Bureau of Land Management adopt an aggressive policy concerning its lands in the area.

2. That the present procedure pertaining to the sale of isolated tracts in this area be simplified. In this connection the matter would be viewed in the light of a broad land-planning program in which the elements of public interest, costs of administration and issuance of leases, and prospective yield in money from the sale of these lands would be taken into consideration.

Section 14 of the Taylor Grazing Act provides in part:

> "Section 14. That Section 2455 of the Revised Statutes, as amended, is amended to read as follows: 'Section 2455. Notwithstanding the provisions of Section 2357 of the Revised Statutes (U.S.C., title 43, sec. 678) and of the Act of August 30, 1890 (26 Stat. 391), it shall be lawful for the Secretary of the Interior to order into market and sell at public auction, at the land office of the district in which the land is situated, for not less than the appraised value, any isolated or disconnected tract or parcel of the public domain not exceeding seven hundred and sixty [a] acres which, in his judgment, it would be proper to expose for sale after at least thirty days' notice by the land office of the district in which such land may be situated: - - -".

The above quoted provisions are readily adaptable to most of the public domain lands in the Lower Platte sub-basin and a program looking to such disposition of it is suggested. This means that

(a) Recent legislation increased this acreage to 1520.

instead of waiting for individual applications and then dealing with them on a case basis, the Bureau of Land Management would initiate a program to include:

1. Listing all lands found to be suitable for public sale in the area.

2. Issuance of individual notices to adjacent landowners and to the general public through local newspapers, giving essential information such as description of lands to be sold, place and date of sale, and minimum prices at which the lands will be offered at public sale.

3. The conduct of sales locally in accordance with schedules contained in the notices.

4. Curtailment of the present leasing policy in the area in favor of an aggressive sale policy.

Certain of the presently unleased lands consist of irregular tracts located on the banks of the main streams. For the present at least these should be excluded from any program of public sale because they may be needed in connection with proposed flood control and irrigation programs in the area. Thus, the interest of the government would be safeguarded, so far as these lands are concerned, by eliminating possible future damage claims or condemnation procedures that might occur if they were transferred from Federal ownership at this time. These tracts total 1222.65 acres and are described as follows:

6th Principal Meridian:

T8N-R19W; Sec. 4, Lot 11	3.80	Acres
T9N-R13W; Sec. 25, Lot 4; Sec. 32, Lot 1	29.00	"
T17N-R13E; Sec. 4, Lot 1; Sec. 6, Lots 1 & 2; Sec.10, Lot 1	61.45	"
T18N-R12E; Sec. 8, Lots 1,2,4; Sec. 10, Lot 1	242.90	"
T18N-R17W; Sec. 35, Lot 4	19.80	"
T19N-R18W; Sec. 8, Lot 3	24.00	"
T20N-R12E; Sec. 8, Lot 4	60.50	"
T21N-R18W; Sec. 17, Lot 4	.95	"
T22N-R11E; Sec. 14, Lot 1	24.30	"
T22N-R19W; Sec. 32, Lot 2	1.00	"
T22N-R20W; Sec. 15, Lot 1	.95	"
T23N-R11E; Sec. 2, Lot 1; Sec. 4, Lot 1; Sec. 14, Lot 1; Sec. 24, Lots 1 & 2	185.40	"
T33N-R4W; Sec. 2, Lot 1; Sec. 3, Lots 5,6,7,8; Sec. 10, Lots 1,2,3,4; Sec. 11, Lot 4	568.60	"
T24N-R32W; Sec. 32, Lot 7; Sec. 33, Lot 5	1.30	"

This latter tract may be needed for State Highway purposes. The present grade of U.S. 81 between Mullen and Tryon is in a lane that crosses these lots.

From the foregoing it would appear that approximately 17,300 acres of public domain in the sub-basin are suitable for public sale. This includes the 6,017.39 acres reported to be leased as of July, 1947, under Section 15 of the Taylor Grazing Act. Random inquiry among present lessees indicates that the majority of them would prefer to own the land and that the tracts would bring an average of $5.00 per acre at this time. At this rate these lands would yield a sale income of about $86,500. To accomplish this it would be necessary to modify the present procedure as proposed in an earlier paragraph. This would involve of course an orderly and equitable cancellation of certain outstanding grazing leases.

In view of the above it is further recommended that the Bureau of Land Management undertake no improvement of any kind on its lands in the sub-basin but that consideration be given to a program that would dispose of the lands at public sale wherever such action would meet the greatest public interest after first affording the State of Nebraska an opportunity, if desired to acquire any of such tracts that it considers to be necessary to facilitate its programs concerning wildlife, conservation and recreational activities in the State. It is believed that if action along these lines is approved the desired results can be accomplished to the best satisfaction of all concerned by scheduling sales at the respective county court houses on given dates, these dates and places to be made known by press releases, posters and individual notices to adjacent landowners. An orderly settlement of many conflicts now arising through public sale and grazing lease application can be resolved in most cases by local contacts with interested parties. It is suggested that many of the grazing leases now in effect may be terminated by waiver or otherwise and that all future applications for renewal of present leases first be considered from the standpoint of public sale.

Submitted March 26, 1948.

John Q. Peterson,
Range Examiner.

Approved - March 31, 1948.

Robert D. Nielson,
Land Economist,
In Charge of Missouri Basin Studies.

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County	Year Issued
Gosper	1938
Lincoln	1926
Garfield	1938
Custer	1926
Brown	1938
Buffalo	1924
Sherman	1931
Wheeler	1937
Rock	1937
Butler	1924

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MISSOURI RIVER BASIN INVESTIGATIONS
BILLINGS, MONTANA

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DIVISION OF LAND PLANNING

LOWER PLATTE RIVER AREA
PUBLIC DOMAIN MAP
NEBRASKA

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